RadioShack®
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18-Range Manual Range Analog Multimeter

OWNER'S MANUAL —
Please read before using this equipment.

22-223

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⚠ WARNING ⚠

- USE EXTREME CAUTION IN THE USE OF THIS DEVICE. IMPROPER USE OF THIS DEVICE CAN RESULT IN INJURY OR DEATH. FOLLOW ALL SAFEGUARDS SUGGESTED IN THIS OWNER'S MANUAL IN ADDITION NORMAL SAFETY PRECAUTIONS IN DEALING WITH ELECTRICAL CIRCUITS. DO NOT USE THIS DEVICE IF YOU ARE UNFAMILIAR WITH ELECTRICAL CIRCUITS AND TESTING PROCEDURES.
- IF THIS EQUIPMENT IS USED IN A MANNER NOT SPECIFIED BY THE MANUFACTURER, THE PROTECTION PROVIDED BY THE EQUIPMENT MAY BE IMPAIRED.
- TO REDUCE THE RISK OF FIRE OR SHOCK HAZARD, DO NOT EXPOSE THIS PRODUCT TO RAIN OR MOISTURE.
- FOR INDOOR USE ONLY.

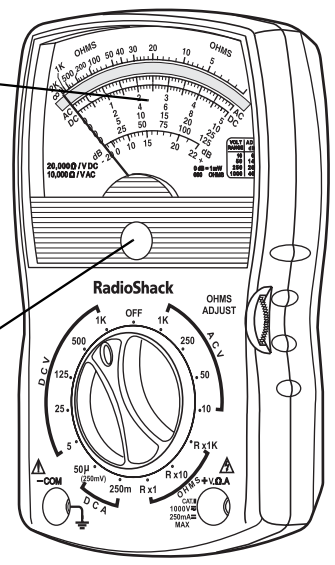
CAUTION

- Completely read this manual before using the meter.
- This meter passes the stringent safety tests required by Underwriters Laboratories.

NOTE

The UL mark does not indicate that this product has been evaluated by Underwriters Laboratories for the accuracy of its readings.

Precision Meter Movement – resistant to mechanical shock.



Zero Adjustment Screw

Rugged Construction – your meter is perfect for your workshop or tool kit.

Flexible – you can use the meter to measure AC and DC voltages, DC current, and resistance.

A WORD ABOUT SAFETY

We have taken every precaution in designing this meter to ensure that it is safe. Safe operation depends on you, the operator. We recommend that you follow these simple safety rules.

- This equipment is rated for installation category II (max. 3600 VA).
- Never apply voltages to the meter that exceed the limits given in the specifications.
- Use extreme caution when working with voltages above 30V RMS and 42.4V peak or 60V DC. Always disconnect power from the circuit you are measuring before you connect test leads to high-voltage points.
- Never connect to a voltage source when you select the DC current or resistance measurement.
- Always discharge any capacitors of the circuit under test before you attach test leads.
- Always turn off power and disconnect the test leads from the circuit before replacing the meter's battery or the fuse.
- Never operate the meter unless its back cover is fully closed and the screws fully tightened.
- Because many AC/DC sets have a potentially hot chassis, be sure the top of your workbench and the floor underneath it are made of non-conductive materials.

This meter is fully calibrated and tested. Under normal use, no further adjustment should be necessary. If the meter requires repair, do not try to adjust it yourself. Take it to your local RadioShack store. ⚠ ✸ ✎

SAFETY MARKS

For your safety, we have added special markings to the meter's panel to remind you of the measurement limitations.

1000V≂ 250mA⎓ MAX — To avoid electric shock or instrument damage, do not connect the red lead to any source of more than 1000 volts DC or AC with respect to earth/ground. The maximum input limit for voltage measurement is 1000V DC or AC, and the maximum input limit for current measurement is 250 mA DC.

Caution: Be extra careful when making high-voltage measurements; DO NOT TOUCH TERMINALS OR PROBE ENDS.

Caution: Risk of electric shock! Refer to the complete operating instructions.

The meter is protected by double insulation.

CAT II — This equipment is rated for INSTALLATION CATEGORY II (3600VA max.).

! IMPORTANT !

If an icon appears at the end of a paragraph, go to the box on that page with the corresponding icon for pertinent information.
⚠ — Warning ! — Important ✎ — Note ✸ — Caution 💡 — Hint

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⚠ WARNING ⚠

- To avoid electrical shock, disconnect both of the test leads from any equipment before you install or replace the meter's battery.
- Do not operate the meter until the battery is properly installed and the back cover is in place and secured.
- Dispose of old batteries promptly and properly. Do not burn or bury them.
- Never connect the test leads to a source of voltage when you have set the function selector to any of the OHMS or DCA positions.
- If you connect one test lead to a hot wire first and touch the other test lead tip, you could receive an electric shock.

CAUTION

- Use only a fresh battery of the required size and recommended type.
- Dispose of an old battery promptly and properly. Do not burn or bury it.
- If you do not plan to use the multimeter for a few weeks, remove the battery. Batteries can leak chemicals that can destroy electronic parts.
- Do not try to measure voltage greater than 1000V DC/1000V AC.

NOTE

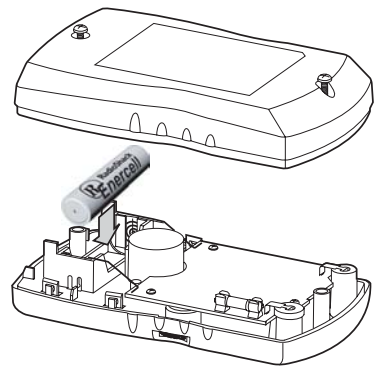
- In AC wiring circuits, the ground lead is usually a green, white, or bare lead and the hot wire is usually red, black, or blue. In DC wiring circuits, the ground lead is usually a black lead; the hot wire is usually red.
- If you are unsure of the voltage present in the circuit, set the meter to 1KV DC or AC accordingly.
- If the reading is within the full scale value of the lower ranges, disconnect the test leads from the circuit under test, then select a suitable range and repeat Steps 2 and 3 in "Measuring DC Voltage" to get the best reading.

HINT

When you are not using the meter, set the function selector to **OFF**.

PREPARATION

Installing a Battery



Your meter requires one AA battery (not supplied) for resistance checking. Batteries are available at your local RadioShack store or online at www.radioshack.com. ⚠

1. Set the function selector to **OFF**. Then unplug the test leads.
2. Use a Phillips screwdriver to loosen both screws on the meter's back cover.
3. Remove the meter's back cover.
4. Install a fresh battery according to the polarity markings (+ and –) in the battery compartment.
5. Replace the meter's back cover and secure it with the screws.

Replace the battery when you cannot adjust the pointer to 0 ohms on the top scale when you measure resistance (see "Measuring Resistance" on Page 3) or the meter stops operating properly.

Connecting the Test Leads

The test leads (black and red) supplied with your meter are rated for 1000 volts. Use only test leads of the same rating with the meter. You can order replacement leads from your local RadioShack store.

Remove the protective plugs from both test leads. Then plug the black test lead's right-angled end into –COM (common) on the front of the meter. Then plug the red test lead's right-angled end into +V.Ω.A. ⚠

Zero Adjustment

If the pointer on the display does not rest exactly over the 0 on the left side of the AC/DC scale, use a small screwdriver to adjust the plastic screw in the window of the meter to set the pointer to 0.

OPERATION

Taking Accurate Measurements

For the most accurate reading, the temperature should be between 64.4° and 82.4°F (18° and 28°C) (80% RH maximum).

When you take readings, keep the meter lying flat on a non-metallic surface. Also, use a range setting that results in a reading in the upper third of the meter scale.

For exact readings, look at the scale from the point where the pointer and its reflection on the mirror are lined up (one on top of the other.)

Measuring Voltage

Measuring High Voltages

When you measure voltage in a high-voltage circuit, do not try to position both probes at once. Connect the black test lead first to the circuit's neutral or ground lead. Then probe for voltages with the other probe. This helps prevent you from accidentally touching a hot wire. ⚠

Measuring DC Voltage

1. Set the function selector to one of the DCV positions.
2. Connect the test probes to the circuit.
3. Read the voltage on the scale.

Measuring AC Voltage

1. Set the function selector to one of the ACV positions.
2. Connect the test probes to the circuit.
3. Read the voltage on the scale.

Measuring 3-Phase AC Voltages

We designed this meter to measure household AC voltages. It is not intended for commercial or industrial use. If you want to measure 3-phase, line-to-line voltages, please note the following.

- Because of the dangers inherent in measuring three-phase circuits, we strongly recommend you do not use this meter for such applications.
- If you choose to make the measurements, use extreme care. The phase-to-phase voltage will be greater than the circuit's rated voltage (line-to-ground).
- Three-phase industrial circuits are extremely powerful. You can be burned severely and even killed if you create an accidental short in these panels.
- Before measuring voltages, put on protective clothing – a face shield and fireproof gloves and upper body protection is required. If you do not have this protection DO NOT MEASURE THESE CIRCUITS.

⚠ WARNING ⚠

- Never connect the test leads to a source of voltage when you have set the function selector to any of the DCA positions.
- Before you make a resistance measurement, be sure the circuit under test has all power removed and any associated capacitors are fully discharged.
- Do not let any water drip inside the meter while cleaning it.
- Make sure that the meter is completely dry before using it.
- To avoid electric shock, you must disconnect the test leads before you remove the back cover. Do not operate your meter until the back cover is in place and secured.

CAUTION

Do not use a fuse brand or rating other than these specified here. Doing so might damage your meter.

NOTE

- For an absolute dB measurement, the circuit impedance must be 600 ohms. 0 dB = 1 milliwatt dissipated in a 600 ohm impedance (equivalent to 0.775V across 600 ohms).
- Before you measure the component's resistance in a circuit, disconnect one lead of the component from the circuit. This prevents other components in the circuit from interfering with the reading.

Limited Ninety-Day Warranty

This product is warranted by RadioShack against manufacturing defects in material and workmanship under normal use for ninety (90) days from the date of purchase from RadioShack company-owned stores and authorized RadioShack franchisees and dealers. EXCEPT AS PROVIDED HEREIN, RadioShack MAKES NO EXPRESS WARRANTIES AND ANY IMPLIED WARRANTIES, INCLUDING THOSE OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE LIMITED IN DURATION TO THE DURATION OF THE WRITTEN LIMITED WARRANTIES CONTAINED HEREIN. EXCEPT AS PROVIDED HEREIN, RadioShack SHALL HAVE NO LIABILITY OR RESPONSIBILITY TO CUSTOMER OR ANY OTHER PERSON OR ENTITY WITH RESPECT TO ANY LIABILITY, LOSS OR DAMAGE CAUSED DIRECTLY OR INDIRECTLY BY USE OR PERFORMANCE OF THE PRODUCT OR ARISING OUT OF ANY BREACH OF THIS WARRANTY, INCLUDING, BUT NOT LIMITED TO, ANY DAMAGES RESULTING FROM INCONVENIENCE, LOSS OF TIME, DATA, PROPERTY, REVENUE, OR PROFIT OR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, EVEN IF RadioShack HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

Some states do not allow limitations on how long an implied warranty lasts or the exclusion or limitation of incidental or consequential damages, so the above limitations or exclusions may not apply to you.

In the event of a product defect during the warranty period, take the product and the RadioShack sales receipt as proof of purchase date to any RadioShack store. RadioShack will, at its option, unless otherwise provided by law: (a) correct the defect by product repair without charge for parts and labor; (b) replace the product with one of the same or similar design; or (c) refund the purchase price. All replaced parts and products, and products on which a refund is made, become the property of RadioShack. New or reconditioned parts and products may be used in the performance of warranty service. Repaired or replaced parts and products are warranted for the remainder of the original warranty period. You will be charged for repair or replacement of the product made after the expiration of the warranty period.

This warranty does not cover: (a) damage or failure caused by or attributable to acts of God, abuse, accident, misuse, improper or abnormal usage, failure to follow instructions, improper installation or maintenance, alteration, lightning or other incidence of excess voltage or current; (b) any repairs other than those provided by a RadioShack Authorized Service Facility; (c) consumables such as fuses or batteries; (d) cosmetic damage; (e) transportation, shipping or insurance costs; or (f) costs of product removal, installation, set-up service adjustment or reinstallation.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

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Measuring DC Current ⚠

1. Set the function selector to the 250 mA DCA position.
2. Break the circuit in which you want to measure current.
3. Connect the black probe to the negative side of the break and the red probe to the positive side of the break.
4. Read the results on the scale.
5. If the reading is in the lower part of the scale, set the function selector to the lower DCA position and try again.

Measuring Decibels

1. Set the function selector to one of the ACV positions.
2. Connect the test probes to the signal you want to measure.
3. If you have set the function selector to 10V AC, read the dB measurement directly on the bottom scale. For other settings, add the appropriate number of dB to the reading. (See the chart at the lower right of the meter scale.)

Measuring Resistance ⚠

1. Disconnect power from the circuit you are testing.
2. Set the function selector to one of the OHMS positions.
3. Touch the probes together and turn OHMS ADJUST to bring the pointer to the "0" position on the top scale.
4. Touch the probes across the circuit or component you are testing, and read the results on the scale.

CARE

Keep the meter dry; if it gets wet, wipe it dry immediately. Use and store the meter only in normal temperature environments. Handle the meter carefully; do not drop it. Keep the meter away from dust and dirt, and wipe it with a damp cloth occasionally to keep it looking new.

Cleaning

To keep the meter looking new, occasionally wipe it with a cloth slightly dampened with water. Do not use harsh chemicals, cleaning solvents, or strong detergents to clean the meter. ⚠

Replacing the Fuse

If the meter does not operate, you might need to replace the fuse. ⚠

The meter contains a 500mA, 250V ceramic fuse (Littelfuse 216.500 or Bussmann Fuse GDA S501) (Radio Shack Cat. No. 270-1070).

1. Set the function selector to **OFF** and unplug the test leads.
2. Use a Phillips screwdriver to loosen both screws on the back cover of the meter. Then remove the back cover of the meter.
3. If the fuse is blown, replace it with one specified here.
4. Replace the back cover of the meter then secure it with the screws.

SPECIFICATIONS

Ranges ..... AC Voltage: 10V, 50V, 250V, 1000V
DC Voltage: 5V, 25V, 125V, 500V, 1000V
DC Current: 250 mA, 50 µA (250 mV)
Resistance: 2k, 20k, 2M (Center Scale 20 ohm)
Decibel: –20 to +62 dB
Accuracy .....
DCV: ± 3 % of Full Scale Value
ACV: ± 4 % of Full Scale Value
DCA: ± 3 % of Full Scale Value
Resistance: ± 3 % of Full Scale Length
Sensitivity .....
AC Voltage: 10000 Ohm/Volt
DC Voltage: 20000 Ohm/Volt
Meter Movement ..... Three-Color, Mirrored Scale, 37 µA Movement
Operating Temperature ..... 41 to 104°F (5 to 40°C)
Storage Temperature ..... –4 to 140°F (–20 to 60°C)
Humidity: Maximum Relative Humidity 80% for Temperature up to 31°C, Decreasing Linearity to 50% Relative Humidity at 40°C.
Power Requirements ..... One AA 1.5-Volt Battery
Pollution Degree 2
Altitude ..... up to 6561.6 feet (2000 m)
Dimensions (LWH) ..... 5.75 x 3.40 x 1.70 in. (146 x 86 x 43 mm)
Weight ..... 6.0 oz (170 g)

RadioShack Corporation
Fort Worth, Texas 76102

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